A Dynamic Account for the Scope Properties of Evidentials*

Yuto HIRAYAMA

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1 Introduction

This study implements the idea described in Hirayama (to appear,a) as to why evidentials resist the environment under negation and epistemic modals, based on three indirect evidentials: the English *apparently* and *seem*, and the Japanese *yooda*. Section 2 reviews the findings presented in Hirayama (to appear,a), and Section 3 examines the evidence referred to by those evidentials. Section 4 provides a dynamic account for the findings, following a discussion of the not-at-issue dimension of the evidential component. Lastly, Section 5 concludes the paper.

2 A review

This section reviews the findings of Hirayama (to appear,a), in which the semantic contribution of evidentials cannot be under the scope of negation and epistemic modals. Before discussing data, a note on the syntactic properties of English and Japanese is in order. In English, the surface ordering of the evidentials and other operators in the rest of the sentence is not directly reflected in their scope relation. Specifically, let EV and OP be an evidential and another operator such as negation and epistemic modals, respectively. If a sentence contains both EV and OP, then there are potentially two scope relations: EV > OP and OP > EV.

On the other hand, Japanese is often said to be a scope-rigid language, where the surface ordering of operators determines the scope interpretation, especially as far as the right periphery is concerned. The difference between the two languages is exemplified in (1).

(1) a. John might have won the game. (Rullman and Matthewson (2018:281))
Available: It is possible that John won the game.
Available: It was possible that John would win the game.
b. John-ga siai-ni kat-ta kamosirenai.
John-NOM game-to win-PAST might
'John might have won the game'
Available: It is possible that John won the game.
Unavailable: It was possible that John would win the game.

As is seen in the possible interpretations, the English *might have* combination allows either *might* or PAST to scope over the other operator. However, the Japanese PAST-*kamosirenai* sequence can only be interpreted as *kamosirenai*, which is located in a more peripheral position than PAST, scoping over PAST. PAST has to be located to the right of *kamosirenai* in order to take a wider scope. Therefore, if OP_1 is located to the right of OP_2, the the only available scope relation is $OP_1 > OP_2$. Evidentials, as we will see, cannot take a wider scope over negation and epistemic modals. As a result, the EV-OP sequence in Japanese (where OP stands for negation or epistemic modals) is infelicitous, regardless of the context.

Let us start with negation. First, the Japanese *yooda* cannot tolerate being under the scope of negation:

(2) #Ame-ga fut-tei-ru yoode-nai.
rain-NOM fall-PROG-PRES yooda-NEG
'(Intended) It is not the case that it seems that it is raining.'

In (2), *yooda* is located to the left of negation, which means that negation scopes over *yooda*. The oddness of (2) suggests the unavailability of such a scope relation.

Turning to English cases, I assume that the semantic contribution of evidentials that interacts with negation and epistemic modals is to convey that the speaker has perceived an event that instantiates the proposition serving as evidence of the prejacent (henceforth, evidence proposition), as in Davis and Hara (2014). Informally, an evidential contributes the speaker's perception of such an event to the context.

With this assumption, negation scoping over evdientials amounts to saying that

there is no evidence on the part of the speaker. The context of (3) forces this interpretation, which evidentials cannot tolerate:

(3) (You have been working in a windowless room with thick walls that prevent you from hearing sounds from outside, so you cannot know the condition of the weather. You say to yourself:)
a. #Apparently it is not raining.
b. #It does not seem that it is raining.

In (3), the speaker has no information about the weather outside the room, and hence has no evidence of the prejacent *it is raining*. The examples in (3) would be acceptable if negation took a wider scope than negation.

Next, we examine the interaction with epistemic modals. As is seen in (4), *yooda* is infelicitous if it is in the scope of epistemic modals:

(4) #Ame-ga fut-tei-ru yoo-dearu kamosirenai.
rain-NOM fall-PROG-PRES yooda-COP might
'(Intended) It is might be the case that it seems that it is raining.'

In English, *apparently* and *seem* show resistance to the case where epistemic modals take wider scope over the existential statement on evidence, that is, where the existence of evidence is inferred.[1)]

(5) (You are working in a room, and you hear something hitting the roof. You think that it might be rain, but you know that sometimes rats run around the attic, so it might be the sound of rats. You say to yourself:)
a. #Apparently it might be raining.
b. #It might seem that it is raining.

What can serve as evidence of rain in this case is the sound of rain hitting the roof. However, the speaker is not sure whether it is actually the sound of rain. Therefore, the context in (5) implies only that it is possible that the speaker has perceived evidence of rain (i.e., the sound of rain hitting the roof), which is the wider-scope reading for *might*. The incompatibility of the sentences in (5) with this context shows

that such a scope relation cannot be obtained.

Note that there are attested examples in which the contribution of *might* scopes over that of *seem*:

(6) When they all get off the bus at the same stop, Julian's mother offers the boy a penny–a foolish gesture of noblesse oblige–and the boy's mother punches the old lady, leaving her stricken on the sidewalk. On first reading, **it might seem that what destroys Julian's mother is the violent attack by the large woman**, who represents the rage of the whole black race, according to Julian. However, it becomes painfully evident in the staged performance that it is Julian's cruelty toward his mother that kills her. (COCA 2015)

In this example, *seem* is anchored to the addressee rather than to the speaker; in other words, it refers to the addressee's evidence. This situation is different from that in (5b), where *seem* refers to the speaker's evidence. This becomes clearer, given the following contrast:

(7) a. #It is possible that it seems that it is raining.
b. It is possible that it seems to John that it is raining.

Assuming that *seem* has a strong tendency to be interpreted as being anchored to the speaker, the contrast in (7) indicates that the speaker-anchored *seem* cannot fall within the scope of modals. However, such a scope relation is available when *seem* is anchored to someone else. This study focuses on the speaker-anchored *seem*, and leaves the treatment of the someone-else-anchored *seem* for future research.

Note that the scope properties of the evidentials we discussed thus far are not specific to English and Japanese. A number of previous studies (Aikhenvald (2004), Faller (2002), Matthewson et al. (2007), Murray (2010), among others) have found that the evidentials they address always take a wider scope than negation.[2)] Although the unavailability of the wider scope of epistemic modals has not been studied as extensively as negation has, Faller (2002) observes that Quzco Quechua evidentials are obligatorily interpreted as having a wider scope than that of an epistemic modal.

3 Evidence as knowledge

In the previous section, we assumed that one of evidentials' contributions is to assert the speaker's perception of the evidence. This section observes that, in addition to this contribution, evidentials require that the evidence be part of the speaker's knowledge. This is motivated by the observation by Takubo (2009) that the evidence that evidentials refer to must not be hypothetical:

(8) (A and B have been working in a room with the curtains closed, and so do not know anything about the weather. Now, A opens the curtains and sees puddles on the ground:)
A: There are puddles.
a. #B: Then, apparently it rained.
b. #B: Then, it seems that it rained.
c. #B: Sorenara ame-ga fut-ta yooda.
then rain-NOM fall-PAST yooda
'Then, it seems that it rained.'

In (8), the speaker's evidence is not her own; she has not witnessed the puddles herself. Rather, the speaker hypothetically assumes from A's utterance that there is evidence of rain (i.e., puddles). The oddness of B's replies in (8) indicates that hypothetical information does not qualify as evidence of evidentials' prejacents.

If evidence is required to be part of the speaker's knowledge, the oddness of those replies follows straightforwardly; in (8), the speaker does not know the proposition serving as the evidence, that is, the proposition *there are puddles on the ground*, because it comes from A's report. McCready (2010a) argues, from a different perspective, that all evidentials require their evidence to be knowledge. Her argument is based on the observation that Japanese evidentials are judged to be infelicitous when the speaker is not sure whether her evidence is real. Specifically, the use of evidentials is odd when the speaker suspects that her cognition might not be working properly, because she might be dreaming or her brain might not be functioning correctly.[3)]

4 Implementation

This section provides a formal account for why evidentials resist being under the scope of negation and epistemic modals. I adopt the framework of update semantics following Veltman (1996). Section 4.1 introduces some basic notions, such as information state, update, and treatment of operators. Section 4.2 discusses the assertoric content sof an utterance versus it not-at-issue content, including how it has been treated in dynamic systems. Section 4.3 presents my proposed semantic contribution of evidentials, where evidentials contribute to two levels of meaning, and illustrates how it captures the data presented in Section 2.

4.1 Basic notions

I assume that the context is modeled with the *common ground* (*cg*) which is the set of propositions known by every participant in the discourse or the *context set* (*cs*), which is the set of worlds compatible with the knowledge of every participant, that is, $\cap cg$. When someone utters an ordinary proposition p that is the set of worlds where p is true, it is regarded as a proposal to *update* the context such that the updated common ground will include p. Thus, if the proposal is approved, the resulting context set is the intersection of the context set before the update and p.

(9) a. $cg = \{p: p$ is known by every participant in the discourse$\}$.
b. $cs = \cap cg = \{w: \forall q[q \in cg \rightarrow w \in q]\}$.
c. If p is the set of p-worlds, then updating *cs* with p, represented as $cs[p]$, is a proposal to add p to *cg*; that is, $cs[p] = cs \cap p$.

Propositions with operators such as negation and epistemic modals update the information state as in (10). A negated proposition $\neg p$ in (10a) subtracts from *cs* the result of updating *cs* with p, hence eliminating p-worlds from *cs*. Unlike p and $\neg p$, propositions with epistemic modals do not eliminate worlds. They test whether the current context set meets a certain condition. As in (10b), $\Diamond p$, corresponding to *might p*, tests whether the intersection of *cs* and p becomes empty or not. If the result is not empty, that is, if there is at least one p-world (p-possibility) in *cs*, *cs* passes the test, and the input information state returns untouched. If the intersection becomes empty, that is, if there is no p-world in *cs*, it returns the empty set, which is a

contradiction. Although this study focuses on possibility modals such as *might* and *kamosirenai*, (10c) presents the treatment of $\Box p$ (*must p*); defined as the dual of $\Diamond p$ (cf., von Fintel and Gillies (2007)).

(10) a. $cs[\neg p] = cs - cs[p]$.

b. $cs[\Diamond p] = \begin{cases} cs & \text{if } cs \cap p \neq \emptyset \\ \emptyset & \text{if } cs \cap p = \emptyset \end{cases}$

c. $cs[\Box p] = cs[\neg \Diamond \neg p]$.

4.2 Assertion versus not-at-issue content

The semantics of a sentence sometimes contribute to more than one level of meaning; in addition to the truth-condition or the assertoric content, known as at-issue content, a sentence may have non-at-issue content that is a presupposition or a conventional implicature of the sentence.[4)] I do not distinguish clearly between presuppositions and conventional implicature. Instead, I use the notion of not-at-issue content as the semantic content that is associated with the lexical meaning of words occurring in a sentence, but that does not contribute to its truth-conditional dimension.

Not-at-issue content differs from at-issue content in various ways. According to Potts (2003), conventionally implicated content does not have scope interactions with other operators, such as negation, modals, and attitude predicates. Furthermore, because they are not part of an assertion, which is a main point of the utterance, the addressee cannot deny not-at-issue content upon hearing a sentence that includes such. Given that appositive content is not-at-issue, we have the following:

(11) A: Tivi, who is a cat, likes to chase her tail.
B: No, she doesn't (like to chase her tail). She's afraid of it.
B: #No, she isn't (a cat). (Murray (2014:2))

In the conversation in (11), B cannot deny the appositive content *Tivi is a cat*, because it is not part of the assertion or the truth-condition.

Murray (2010, 2014) argues that the evidential component (i.e., information about the existence and type of evidence) of Cheyenne evidentials is not-at-issue,

because it projects through negation, as in (12a), and cannot be the target of denial, as in (12b):

(12) a. É-sáa-némené-he-sėstse Floyd.
3-NEG-sing-AGR-REP.3SG Floyd
Available: 'Floyd didn't sing, they say' / Unavailable: 'Floyd sang, they didn't say' (Murray (2010:62))

b. A: É-némene-sėstse Kathy.
3-sing-REP.3SG Kathy
'Kathy sang, I hear.'
B: No, she didn't (sing). She danced.
B: #No, you didn't (hear that). (Murray (2014:4))

Neither the negation in (12a) nor B's denial in (12b) can target the evidential component (the information that the user of the reportative evidential has heard about the content of the prejacent). These patterns parallel the evidentials examined here. In Section 2 we saw that the speaker's perception of the evidence cannot be negated. In addition, it cannot be the target of denial, as (13) shows:

(13) a. A: Apparently it is raining.
B: #That's not true. It is raining but you have never seen evidence such as puddles!

b. A: It seems that it is raining.
B: #That's not true. It is raining but you have never seen evidence such as puddles!

c. A: Ame-ga fut-tei-ru yooda.
rain-NOM fall-PROG-PRES yooda
'It seems that it is raining.'
B: #Sore-wa tigau. Ame-wa fut-tei-ru ga kimi-wa
that-TOP wrong rain-NOM fall-PROG-PRES but you-TOP
mizutamari-no-yoona syooko-o mi-tei-nai.
puddle-GEN-such.as evidence-ACC see-PERF-NEG
'That's wrong. It is raining but you have never seen evidence such as puddles.'

In her replies, B admits the truth of the prejacent in the sentence uttered by A, but tries to deny that she has perceived the evidence of the prejacent. The infelicity of B's replies suggests that the evidential component of these evidentials is part of the not-at-issue content.

4.2.1 Digression

One might be tempted to explain the scope phenomena reviewed in Section 2 by postulating that the evidential component is not-at-issue, as Murray (2010, 2014) proposes for Cheyenne evidentials. This postulation accounts for English data, because it captures the fact that the evidential component is never interpreted under the scope of negation and epistemic modals. However, it is insufficient for Japanese data, where the sentences are *unacceptable*, rather than having only one of the two possible scope relations. Even if *yooda*'s evidential contribution is not-at-issue content, this does not rule out sentences in which negation or epistemic modals are located to the right of the evidential, but where the evidential component should project to the whole sentence. If this were true, it would make such sentences have only one scope relation, as in English cases. Therefore, we need to explain how the scope relations ¬ > EV and MODAL > EV result in a semantic or pragmatic anomaly, which is why the sentences containing these relations are unacceptable.

It may seem possible that the syntactic assumption on Japanese (that it is a scope-rigid language) blocks the projection of the conventional implicature, making the whole sentence uninterpretable. Specifically, as we saw at the beginning of Section 2, in Japanese, if an operator OP_1 is located to the right of another operator OP_2, then OP_1 has a wider scope than OP_2. In the bad examples in (2) and (4), the negation and epistemic modal are located to the right of *yooda*. Then *yooda*'s evidential component tries to project, but the surface word order and the scope-rigidity require it to be under the scope of those operators, which blocks the projection. As a result, there is no available interpretation for these sentences. Is such an explanation possible? No. This is evidenced by the interpretability of the following case:

(14) Sensei-ga kor-are-ta.
teacher-NOM come-HON-PAST
'The teacher, who is being honored, came'

This sentence is only felicitous when the speaker respects the teacher at the utterance time. This means that the honorific component projects beyond the contribution of the past tense. However, the past tense marker is located to the right of the honorific marker. If the projection-blocking mechanism described is in effect, (14) should be deviant, like (2) and (4). The discussion thus far indicates that the evidentials we are dealing with have some not-at-issue content, evidenced by the deviance of (13). However, postulating simply that the evidential component is not-at-issue does not help to explain Japanese data, and a more desirable analysis of evidentials would be the one that can accommodate Japanese cases as well as English cases.

4.2.2 The treatment of the evidential component in dynamic semantics

Murray (2014) proposes that sentences with evidentials in Cheyenne present three semantic contributions: the at-issue proposition, a not-at-issue restriction, and an illocutionary relation.[5] For example, see the following sentence, which contains a direct evidential:

(15) É-hó′tâhéva-Ø Sandy.
3-win-DIR Sandy
'Sandy won (I witnessed).' (Murray (2014:7))

(15) updates the context set in the following way. First, it introduces the at-issue content *p* (in this case, *Sandy won*) to the discourse, but this information is not added to the common ground (hence, no elimination of worlds in the context set). Second, the not-at-issue restriction, which is the information that the speaker has direct evidence of the prejacent, in this case, restricts the context set to the set of worlds compatible with the not-at-issue information. In this case, the context set becomes the set of worlds divided into *p*-worlds and ¬*p*-worlds where in both, the speaker directly witnesses the proposition *Sandy won*. Finally, the illocutionary relation, which is contributed by the illocutionary mood of the sentence, comes into effect. For the declarative sentence in (15), it is the proposal to add the at-issue proposition to the common ground. If this proposal is accepted, the new context set will be the set of worlds where both Sandy won and the speaker has direct evidence of the event.

What is important in the subsequent discussion is the difference in how the at-issue proposition and the not-at-issue information update the context. Whereas the

former offers a proposal to eliminate worlds where it is not true, the latter is a direct update: it updates the context set without negotiation. In other words, the addressee can refuse the update with the at-issue content, but cannot do so the non-at-issue content. Somewhat simplifying Murray's (2014) analysis, I formulate the update process associated with a sentence containing both at-issue and not-at-issue contents as in (16b), borrowing Potts's (2003) notation as in (16a):

(16) a. $p \bullet q$ denotes an expression where p and q are its at-issue and not-at-issue content, respectively.
b. $cs[p \bullet q] = (cs \cap q)[p]$.

Note that $(cs \cap q)[p]$ differs from $cs[q][p]$, which corresponds to $cs[q \wedge p]$. Here $cs[q \wedge p]$ is a proposal to update cs with $q \wedge p$, whereas $(cs \cap q)[p]$ is a proposal to update the context set that is already restricted by q. This expresses Murray's intuition that not-at-issue content is taken for granted by conversational participants.

4.3 Proposal

I propose the following semantic contribution of the three evidentials examined here:

(17) Let q be a contextually salient proposition.
a. $[\![\text{EVID}]\!] = \lambda p.\lambda w.\ \exists e[q(e)(w) \wedge \text{PERCEIVE}(c_S)(e)(w)]$
$\bullet\ \lambda p.\lambda w.\ \text{KNOW}(c_S)(q)(w) \wedge \text{IND-EVID}(q)(p)(w)$
b. $\text{PERCEIVE}(c_S)(e)(w)$ = the speaker has perceived e in w.
c. $\text{KNOW}(c_S)(q)(w)$ = the speaker knows that q is true in w.
d. $\text{IND-EVID}(q)(p)(w) = q$ serves as indirect evidence of p in w. [6)]

A proposition with evidentials yields both at-issue content and a not-at-issue content. The at-issue content states that the speaker perceives an event that describes the evidence proposition. The not-at-issue content states that the speaker knows that the evidence proposition is true and that it counts as indirect evidence of the prejacent. Because the denotation of (17a) consists of two dimensions of meaning, a familiar functional application is not an available option when EVID is applied to the prejacent. I adopt the mixed application proposed by McCready (2010b:20), which distributes the argument to both the at-issue and not-at-issue content of the functor. As a result,

the argument slots for a proposition in both dimensions are saturated by the prejacent (Note that the variable *p* does not appear in the at-issue content, which means that it is not affected by the prejacent after the application of EVID to the prejacent).

The not-at-issue content, requiring the speaker to know the evidence proposition, is based on McCready's (2010a) observation, reviewed in Section 3, and captures the oddness of evidentials when the evidence is hypothetical, that is, (8). I repeat only the *apparently* case below:

(18) (A and B have been working in a room with the curtains closed, and so do not know anything about weather. Now, A opens the curtains and sees puddles on the ground:)
A: There are puddles.
#B: Then, apparently it rained.

Let RAIN and PUDDLE be propositions denoting *it rained* and *there are puddles*, respectively. Then B's utterance is represented as in (19a), and it updates the context as in (19b):

(19) a. $[\![\text{EVID RAIN}]\!] = \lambda w.\ \exists e[\text{PUDDLE}(e)(w) \wedge \text{PERCEIVE}(B)(e)(w)]$
• $\lambda w.\ \text{KNOW}(B)(\text{PUDDLE})(w) \wedge \text{IND-EVID}(\text{PUDDLE})(\text{RAIN})(w)$.
b. $cs[\text{EVID RAIN}]$
$= (cs \cap \lambda w.\text{KNOW}(B)(\text{PUDDLE})(w) \wedge \text{IND-EVID}(\text{PUDDLE})(\text{RAIN})(w))$
$[\lambda w.\exists e[\text{PUDDLE}(e)(w) \wedge \text{PERCEIVE}(B)(e)(w)]]$.

The requirement that the speaker knows the truth of the evidence proposition is the not-at-issue content of B's utterance. Therefore, that information is added to *cs* before the at-issue update, which proposes creating a new context set that consists of worlds compatible with the at-issue proposition and the intersection between *cs* and the not-at-issue content. In the context of (18), however, both A and B know that B does not know the evidence proposition, that is, that there are puddles. This means that *cs*, which is the set of worlds compatible with every participant's knowledge, consists only of worlds where B does not know the evidence proposition. Therefore, intersecting *cs* with $\lambda w.\ \text{KNOW}(B)(q)(w)$ results in the empty set, which is a contradiction. Thus, the formulation in (17) theoretically captures the deviance when

evidentials are used without knowledge of the evidence.

One might argue against the proposal in (17), which posits that the speaker's evidenceacquisition event is the at-issue content of the utterance. As shown in (13), the addressee's denial cannot target the information that the speaker is acquainted with the evidence, as in (13a), repeated below as (20):

(20) A: Apparently it is raining.
B: #That's not true. It is raining but you have never seen evidence such as puddles!

This observation exhibits a similar pattern to that of the Cheyenne data in (12), and is consistent with Murray's (2014) analysis, where the evidential component, which describes the speaker's acquisition of evidence and the evidence type, is located in the not-at-issue dimension. The current analysis in (17) incorporates the acquisition event into the at-issue content, so it might appear that this is incompatible with the oddness of the examples in (13).

However, note that while the current analysis treats the existential quantification over the acquisition event as the at-issue content, the requirement that the speaker know the truth of the evidence proposition is not-at-issue. Given that not-at-issue content is taken for granted by conversational participants, when B tries to deny that the speaker has perceived evidence of the prejacent, that is, to reject the proposal to eliminate worlds where such an acquisition event has occurred, *cs* has already been the set of worlds in which the speaker knows that the evidence proposition is true. Denial of the evidence acquisition event implies that A does not know the truth of evidence (although the logical meaning of KNOW does not preclude the possibility that the speaker has perceived the event describing a proposition she knows). Therefore, B's denial is incompatible with the not-at-issue content that A knows the truth of the evidence proposition. Thus the current analysis correctly predicts (20) to be an illicit conversation, because B's reply winds up challenging the not-at-issue content of A's utterance.

4.4 Deriving the scope facts

We start with the unavailability of the wider scope of negation, that is, (2) and (3). Henceforth, I abbreviate the at-issue content of EVID RAIN (i.e., $\lambda w.\ \exists e[q(e)(q) \wedge$

PERCEIVE(c_S)(q)(w)]) as PERCEIVE, and the not-at-issue content (i.e., λw. KNOW(c_S)(q)(w) $\wedge$ IND-EVID(q)(p)(w)), as KNOW-IND-EVID. Given that negation operates only on the at-issue content, the speaker's utterance in those examples (NEG + EVID + RAIN) denotes (21).

(21) $[\![$NEG EVID RAIN$]\!]$ = ¬PERCEIVE • KNOW-IND-EVID.

This utterance updates the context set in the following way:

(22) cs[NEG EVID RAIN]
= (cs ∩ KNOW-IND-EVID)[¬PERCEIVE]
= (cs ∩ KNOW-IND-EVID) − (cs ∩ KNOW-IND-EVID)[PERCEIVE].

The not-at-issue update is applied first, narrowing down the input context set to the set of worlds where the speaker knows that the evidence proposition is true, which counts as indirect evidence of rain. Then, among those worlds in the restricted set, negation subtracts worlds where the at-issue proposition is true, that is, where the speaker has perceived an event that describes the evidence proposition. The resulting set consists of those worlds where the speaker knows that the evidence proposition is true, but she has never perceived any event instantiating that proposition. As mentioned at the end of the previous subsection, this is pragmatically odd; Given the familiar Hintikka-style semantics of knowledge ascription, the semantics of KNOW do not guarantee that the agent to whom the knowledge is ascribed will have experienced an event that instantiates the prejacent of KNOW. However it seems inconceivable that one knows the truth of a proposition without experiencing such an event. Therefore, the resulting context is unacceptable because of the pragmatic anomaly, rather than the semantic contradiction shown in (8).

The claim that knowing a proposition pragmatically implies the existence of the acquisition event is supported by the unavailability of knowledge ascription in the following scenario. Suppose that you know that if it is raining, then there are puddles on the ground. You are now seeing falling raindrops from the window, but you do not see the condition of the ground. Now, you know that it is raining. Combining this and the background conditional knowledge, your knowledge state entails that there are puddles on the ground (i.e., there are puddles on the ground in all worlds

compatible with your knowledge). However, it is difficult to say that you know that there are puddles on the ground. This suggests that knowledge ascription to an agent requires the acquisition event.[7] Whether this requirement is really pragmatic or incorporated into the lexical semantics of KNOW is a topic of future research. However it at least explains why the resulting context set in (22) is unacceptable.

Next, we examine epistemic modals. Given the traditional treatment of *might* in dynamic semantics, we have the following update process (note that the contribution of the possibility epistemic modal does not scope over the not-at-issue content):

(23) $cs[\Diamond\text{EVID RAIN}]$
$= (cs \cap \text{KNOW-IND-EVID})\,[\Diamond\text{PERCEIVE}]$.
$= \begin{cases} (cs \cap \text{KNOW-IND-EVID}) & \text{if } (cs \cap \text{KNOW-IND-EVID}) \cap \text{PERCEIVE} \neq \emptyset \\ \emptyset & \text{if } (cs \cap \text{KNOW-IND-EVID}) \cap \text{PERCEIVE} = \emptyset \end{cases}$

Here, (23) contains a possibility epistemic modal (*kamoshirenai* in Japanese and *might* in English), so it poses a test on the context set. The resulting test checks whether there remains at least one world after intersecting *cs* ∩ KNOW-IND-EVID (the set of worlds compatible with participants' knowledge and the proposition that the speaker knows the truth of the evidence proposition) and PERCEIVE (the proposition that the speaker has perceived an event describing the evidence proposition). However, this test plays no role, given that knowing something (at least) pragmatically accompanies experiencing it. If this test fails, it returns the empty set only if all worlds in the original context set *cs* are those where the speaker knows that the evidence proposition is true, but she has never perceived an instantiating event. As shown above, if we know that a proposition is true, it (pragmatically or semantically) implies that we have perceived some instantiation of that proposition. Therefore, such an input context set is quite inconceivable, and regardless of the nature of the context set, it passes the test posed by the epistemic modal. This, in turn, means that the epistemic modal does not make any contribution to the utterance. That is, [◇EVID RAIN] becomes [EVID RAIN], which violates Crnič's (2011) principle of non-vacuity:

(24) The meaning of a lexical item used in the discourse must affect the meaning

> of its host sentence (either its truth-conditions or its presuppositions).
> (Crnič (2011:110)).

In summary, the scope relation ¬ > EV results in a contradiction between PERCEIVE and KNOW, and the relation ◇ > EV violates the pragmatic principle in (24). These effects are obtained because PERCEIVE and KNOW are distributed over two separate meaning dimensions. This line of analysis is not found in previous studies such as Murray (2014), where the evidential component contributes only to the not-at-issue dimension.

5 Conclusion

This study analyzes why the three indirect evidentials *yooda*, *apparently*, and *seem* cannot be under the scope of negation and epistemic modals. The proposed contribution of these evidentials is based on McCready's (2010a) observation that evidence must be part of the speaker's knowledge, and on Murray's (2014) argument that evidentials contribute to both the at-issue and not-at-issue dimensions. The proposed theory empirically more adequate than previous theories because it captures the deviance of Japanese data, which cannot be explained by assuming that evidential components are not-at-issue only.

[Notes]

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1) Krawczyk (2012:43) states that *apparently* is incompatible with *might* in the first place. However, Hirayama (to appear,a) shows that there are attested examples where *apparently* and *might* appear in the same clause.
2) This property is not a universal one; Aikhenvald (2004) observes that some evidentials can scope under negation.
3) McCready revises her argument in McCready (2014), where she observes that evidentials can be used even if the evidence is not part of the speaker's knowledge. Specifically, they are felicitous in the Gettier scenario (cf., Ichikawa and Steup (2018)).

Given this observation, McCready argues informally that an evidential user must have the belief that she knows the evidence. My idea, presented in Section 4, can be implemented even with this complication, but I adopt her former argument for the sake of space.

4) Here, I put aside Gutzmann's (2015) notion of *use-conditional contents*, which he seems to distinguish from conventional implicature. In addition, I focus on the conventional meaning of a sentence; thus I am not talking about conversational implicature and pragmatic effect that are not directly associated with the conventional meaning of lexical items that occur in the sentence.

5) Murray's (2014) formalization, which builds mainly on Bittner (2011), is more elaborate than that introduced here. Nevertheless, my informal introduction is sufficient for the current discussion.

6) Here, we do not delve into the question of what it means for a proposition to be indirect and to be evidence of another proposition. The reader is referred to several recent studies, such as Krawczyk (2012), Davis and Hara (2014), Koev (2017), and Hirayama (to appear,b) that address this question.

7) This is as opposed to the indirect requirement proposed by von Fintel and Gillies (2010) for the English epistemic modal *must*; their analysis states that in order for *must* to be used adequately, the set of worlds created by intersecting all propositions the speaker knows must entail (or be subset of) the prejacent, but the prejacent must not be one of those propositions; in other worlds, the speaker must not directly perceive the prejacent.

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(Graduate Student)

SUMMARY

A Dynamic Account for the Scope Properties of Evidentials

Yuto HIRAYAMA

This study provides a formal implementation of Hirayama (to appear,a), where I associate the unavailability of the wider-scope reading of negation and epistemic modals over evidentials with McCready's (2010a) requirement that evidence referred to by evidentials must be part of the speaker's knowledge. I review the findings in Hirayama (to appear,a) on three evidentials, the English *apparently* and *seem*, and the Japanese *yooda*, and McCready's discussion of evidence as knowledge. After introducing the framework of dynamic semantics (following Veltman (1996)), I refer to Murray's (2014) argument that the evidential component, a semantic component signaling how the speaker has acquired the evidence, is not-at-issue content. Murray's analysis is compatible with some of the data in Hirayama (to appear,a), but it cannot explain the deviance of Japanese examples. My proposal is to distribute the evidential component to two dimensions of meaning, that is, to the at-issue dimension and not-at-issue one. With this proposal, if negation or epistemic modals take a wider scope over evidentials, the resulting context will always be unacceptable.